MYCOTAXON

ISSN (print) 0093-4666 (online) 2154-8889 Mycotaxon, Ltd. ©2017

January–March 2017—Volume 132, pp. 177–182

http://dx.doi.org/10.5248/132.177

Three lichen species in *Buellia*, *Catillaria*, and *Cheiromycina*, new to Poland

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Abstract—Three sterile crustose lichen species, *Buellia arborea* from the Tatra Mts and *Catillaria fungoides* and *Cheiromycina reimeri* from Białowieża National Park, are recorded as new to Poland. The record of *Cheiromycina reimeri* is also the first from Europe. Characteristics of all three species, notes on similar taxa, distribution, and habitat preferences are provided.

Key words—sorediate lichens, lichenized fungi, *Ascomycota*

Introduction

Crustose, persistently or usually sterile lichens have been for a long time one of the most neglected groups of species in the Polish lichen biota, especially before thin layer chromatography (TLC) became a routinely used method in their determination. However, the knowledge on their occurrences, distribution, and ecology have been much improved in the past 15 years, including species reported as either new to Poland or new to science (e.g., Kukwa & Kubiak 2007, Czarnota et al. 2009, Kukwa & Jabłońska 2009, Czarnota & Guzow-Krzemińska 2010, Kukwa et al. 2012, Zduńczyk & Kukwa 2014, Guzow-Krzemińska et al. 2016).

In this paper, we present the first Polish records of three crustose lichen species: *Buellia arborea*, *Catillaria fungoides*, and *Cheiromycina reimeri*.

Material & methods

The material studied is deposited in following herbaria: GPN, FR, KTC, and UGDA. The characteristics of taxa are based on Polish specimens, if not otherwise stated. Lichen substances were studied by thin-layer chromatography (TLC) using the methods of Orange et al. (2001). Reactions of the thalli with C (commercial bleach containing sodium hypochlorite), K (10% solution of potassium hydroxide), and Pd (alcohol solution of paraphenylenediamine) were also checked.

The localities examined are presented according to the modified ATPOL grid square system (Kukwa et al. 2010, 2013 and literature cited therein). The numeration of collecting plots in the Białowieża National Park follows Faliński & Mułenko (1997).

The species

Buellia arborea Coppins & Tønsberg, Sommerfeltia 14: 111. 1992.

Description—Thallus inconspicuous, white, endoxylic except for the concave to convex, crateriform, punctiform to slightly elongated soralia producing mostly dull, blackish-green pigmented soredia. Soredia single or loosely aggregated, externally encrusted with crystals, which more or less dissolve in K, composed of several algal cells surrounded by a stout, colorless or greyish-green pigmented hyphal layer. Apothecia absent. Non-pigmented soredia K+ yellowish, Pd–, C+ yellowish; pigment in soredial walls K+ dulling; atranorin and placodiolic acid detected by TLC.

> Specimen examined—**POLAND**. **Tatra Mts**, **High Tatra Mts**, Tatra National Park, forest unit no 53f, Dolina Rybiego Potoku valley, below Opalone Mt., 49°13′08.9″N 20°05′05.6″E, alt. 1330 m, ATPOL grid square Ge–60, *Plagiothecio-Piceetum*, on wood of decaying log (*Picea abies*), 2.07.2010, P. Czarnota 6700 (GPN).

Distribution & habitat—Although *Buellia arborea* is widespread in the Holarctic, it is a rarely reported lichen, most probably due to its inconspicuous thalli, which are usually sterile. It has been reported from Europe (Estonia, Germany, Great Britain, Norway, Russia: Ural Mts, Slovakia, Sweden, Switzerland, Ukraine), Asia (Russia: Siberia) and North America (Canada, USA) (Dietrich et al. 1992, Tønsberg 1992, Foucard & Nordin 1999, Tønsberg & McCune 2001, Bogdan 2002, Swensson et al. 2004, Lisická 2005, Brackel & Kocourková 2006, Elvebakk & Bjerke 2006, Spribille & Björk 2008, Coppins et al. 2009, Suija et al. 2009, Urbanavichus & Andreev 2010, Davydov & Printzen 2012, Wirth et al. 2013).

In Poland *B. arborea* was found on the exposed wood of a spruce log in the upper montane Carpathian spruce forest.

Comments—The characteristic of Polish material of *B. arborea* agrees with the species description in Tønsberg (1992). For a description of apothecia, which were absent in the examined specimen, see Tønsberg (1992).

Buellia arborea resembles three other lichens—*B. griseovirens* (Turner & Borrer ex Sm.) Almb., *Violella fucata* (Stirt.) T. Sprib., and *Xylographa vitiligo* (Ach.) J.R. Laundon—all of which can also form crateriform soralia with dark-colored soredia and may occupy the same habitat (decorticated logs). All these species occur in Poland and differ in their secondary metabolite compositions: *B. arborea* produces placodiolic acid and does not react with Pd, whereas *B. griseovirens* contains norstictic acid (Pd+ yellow to orange); *V. fucata* has fumarprotocetraric acid (Pd+ red); and *X. vitiligo* produces stictic acid (Pd+ orange) (Tønsberg 1992, Wirth et al. 2013).

Lecanora orae-frigidae R. Sant. is another epixylic species with delimited soralia producing dark outer soredia. It produces, however, usnic acid, zeorin, and xanthones and occurs along the seashores in the arctic and boreal regions of the Northern Hemisphere (Brodo & Vänskä 1984).

Catillaria fungoides Etayo & van den Boom, Lichenologist 33: 107. 2001.

Description—Thallus thin, not clearly delimited, whitish. Soralia ≤0.25 mm in diam., dark brown to black, slightly convex, discrete or sometimes confluent. Soredia globose, farinose, ≤20 µm in diam., the outermost dark brown to almost black, but inner soredia hyaline with colorless or pale brown walls. Apothecia absent. Soredia C–, K– (blood-red crystals not formed in squash-preparation) and Pd–; pigment in soredial walls also K negative; material too scanty for TLC.

Specimen examined—**POLAND. North Podlasie District**, **Bielska Plain**, Białowieża National Park, forest unit no 256, plot L06, 52°46′15″N 23°52′04″E, ATPOL grid square Cg–55, *Circaeo-Alnetum*, on the bark of a hardwood log (*Fraxinus excelsior*), 19.08.2015, M. Kukwa 17314a, A. Łubek (KTC, UGDA).

Distribution & habitat—*Catillaria fungoides* is an epiphytic lichen reported from Africa (Cape Verde), Asia (South Korea, Turkey) and Europe (Czech Republic, the Netherlands, Portugal, Slovakia, Spain) (Boom & Etayo 2001, Boom et al. 2007, Malíček et al. 2014, Aptroot & Moon 2015).

In Poland *C. fungoides* was found on the bark of a hardwood log in a humid, hardwood stand in the Białowieża Forest. The species was sought by the first authors in northern Poland several times; however, it could not be found there. This suggests it is a rare lichen, perhaps confined to well-preserved forest habitats.

Comments—The characteristics of Polish material of *C. fungoides* agree with the species as described in Boom & Etayo (2001). For the description of apothecia, which were absent in the examined specimen, see Boom & Etayo (2001).

Catillaria fungoides is characterized by dark brown to black soralia (resembling sporodochia of some fungi) and the absence of lichen metabolites detectable by standard TLC. This species can easily be confused with *Rimularia fuscosora* Muhr & Tønsberg, which has larger (≤0.6 mm diam.) soralia and contains a trace of norstictic acid (Tønsberg 1992, Boom & Etayo 2001). Norstictic acid can be difficult to detect in TLC when it occurs in trace amounts, but blood-red crystals indicative of its presence are formed in squash-preparations of soralia in K (Tønsberg 1992).

Dark soredia are also formed by *Buellia griseovirens* and *Placynthiella dasaea* (Stirt.) Tønsberg, but they are never as dark brown or black as in *C. fungoides*. Additionally, all three species differ in their chemistries: *C. fungoides* lacks lichen metabolites detectable by TLC; *B. griseovirens* produces atranorin and norstictic acid (sometimes only atranorin or only norstictic acid); and *P. dasaea* contains gyrophoric and lecanoric acids (soredia C+ red) (Tønsberg 1992, Boom & Etayo 2001).

Cheiromycina reimeri Printzen, Nova Hedwigia 84: 262. 2007.

Description—Thallus thin, crustose, contiguous, smooth, greyish green, matt. Conidiomata sporodochia, white, greyish-white or grey, discrete, single or confluent, more or less ellipsoid, up to 0.80 × 0.50 mm, initially flat to moderately convex. Conidiogenous cells terminal or lateral, globose or broadly ellipsoidal, 7–10 × 7–8 µm. Conidia palmate, 2–4 times dichotomously branched, 20–30 µm wide, 15–25 µm tall, multi-septate, terminal branches with 1–2 cells.

Specimens examined—**POLAND. North Podlasie District**, **Bielska Plain**, Białowieża National Park, forest unit no 256, plot H10, 52°46′05″N 23°52′25″E, ATPOL grid square Cg–55, *Tilio-Carpinetum*, on the bark of *Carpinus betulus*, 6.10.2015, M. Kukwa 17681, A. Łubek (KTC, UGDA); plot I09, 52°46′08″N 23°52′20″E, *Tilio-Carpinetum*, on bark of *Carpinus betulus*, 23.08.2015, M. Kukwa 17422, A. Łubek (FR, KTC, UGDA).

Distribution & habitat—*Cheiromycina reimeri* is a corticolous lichen that has been known previously from Turkey and the Russian Far East (Sakhalin Island) (Printzen 2007).

In Poland *C. reimeri* has been found only in Białowieża National Park, twice on the bark of *Carpinus betulus*. Our collections represent the first records of the species in Europe.

Comments—The characteristics of Polish material of *C. reimeri* agrees with the species as described in Printzen (2007).

Cheiromycina reimeri can be confused with two other *Cheiromycina* species: *C. flabelliformis* B. Sutton and *C. petri* D. Hawksw. & Poelt. Both, *C. flabelliformis*

and *C. reimeri* have conidiogenous cells that are distinctly larger than the conidial cells, but in *C. flabelliformis*, the conidiogenous cells do not exceed 9 µm, whereas in *C. reimeri* they are consistently larger than 9 µm. Additionally, the terminal branches of the conidia in *C. flabelliformis* comprise up to 5 cells, while in *C. reimeri* they are 1–3-septate (Printzen 2007). *Cheiromycina petri* can be distinguished from *C. reimeri* by its conidiogenous cells, which are not (or only slightly) larger than its conidial cells, whereas in *C. reimeri*, the conidiogenous cells are always conspicuously larger (Printzen 2007).

Acknowledgments

We are very grateful to Dr Jurga Motiejūnaitė (Vilnius) and Dr Scott LaGreca (Cornell University, USA) for reviewing the manuscript and for valuable comments on a previous version of the paper. Dr Christian Printzen (Frankfurt) is thanked for the confirmation of *Cheiromycina reimeri*. The research leading to these results was funded by the Polish-Norwegian Research Programme operated by the National Centre for Research and Development under the Norwegian Financial Mechanism 2009-2014 in the frame of Project Contract No. Pol-Nor/196829/87/2013 and the grant of Polish Ministry of Science and Higher Education No. N N305 306835.

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